



FAA-E-2409
September 16, 1969

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION SPECIFICATION

TUBE, CATHODE RAY, 16-INCH ROUND

1. SCOPE

1.1 Scope.- This specification sets forth the requirements for a sixteen-inch diameter, round cathode ray tube for use in PPI displays of the Airport Surveillance Radar (Model ASR-4), Airport Surveillance Radar Display System (Model ASRDS), and Airport Surveillance Radar Display System (Model ASRDS-2) equipments.

2. APPLICABLE DOCUMENTS

2.1 FAA standards.- The following FAA standard, of the issue specified in the Invitation for Bids or Request for Proposals, forms a part of this specification to the extent specified herein:

FAA-STD-013 Quality Control Program Requirements

(Copies of this standard and other applicable FAA documents may be obtained from Federal Aviation Administration, Washington, D. C. 20590, ATTN: Contracting Officer. Requests should fully identify material desired, i.e., specification and amendment numbers and dates. Requests should cite the Invitation for Bids, Request for Proposals, or the contract involved, or other use to be made of the requested material.)

2.2 Military specifications.- The following Military specifications, of the issues in effect on the date of the Request for Proposals or Invitation for Bids, form a part of this specification:

MIL-E-1 Electron Tubes, General Specification
 MIL-STD-1311 Test Methods for Electron Tubes
 MIL-E-75 Electron Tubes, Preparation for Delivery of

(Single copies of Military specifications and standards may be requested by mail or telephone from U. S. Naval Supply Depot, 5801 Tabor Ave., Philadelphia, Pennsylvania 19120. For telephone requests call 215-697-3321, 8:00 A.M. to 4:30 P. M. Monday through Friday.)

3. REQUIREMENTS

3.1 Description.-

- (a) Type of deflection - magnetic
- (b) Type of focus - electrostatic
- (c) Angle of deflection - 60°
- (d) Phosphor - P7, aluminized - in accordance with JEDEC standards

3.1.1 Dimensions and pin connections.- Dimensions and pin connections shall be as shown in Figure 1.

3.2 Ratings.- Ratings shall be as listed below. Symbology is in accordance with MIL-E-1. All voltages are with respect to the cathode with the exception of the filament voltage.

<u>Parameter</u>	<u>Absolute Maximum</u>	<u>Minimum</u>	<u>Test Conditions</u>
Filament voltage (E_f) RMS	6.9 V	5.7 V	6.3 V
Grid 1 voltage (E_{c1})	0	-300 V	Adjust
Grid 2 voltage (E_{c2})	700 V DC	---	400
Anode 1 voltage (E_{b1})	5,600 V DC	---	Focus
Anode 2 voltage (E_{b2})	15,000 V DC	---	12,000
Anode 2 breakdown factor (P_{b2})	8 W	---	---

Peak heater cathode voltage (Ehk)	+180 V DC	-180 V DC	---
Grid 1 circuit resistance (Rg ₁)	1.5 megohm	---	---

3.3 CRT faceplate.- The CRT faceplate shall be made of grey glass with approximately 75% transmission.

3.4 Blemishes.- Blemish criteria shall be as described in Method 5106 of MIL-STD-1311, except that the number and size of spots, holes and blemishes shall not exceed those specified below, for combined screen and glass defects. The total useful screen diameter shall be at least 14 3/8 inches minimum.

The useful screen area will be divided into two zones:

Zone A - 8-inch diameter circle in the center of the useful screen area.

Zone B - The remaining useful screen area.

<u>Maximum Diameter</u>	<u>Maximum Number of Blemishes</u>		
	<u>Zone A</u>	<u>Zone B</u>	<u>Total</u>
.01" to .03"	4	5	8
.03" to .04"	1	4	4
.04" to .05"	1	2	3

Minimum separation between any two blemishes shall be two inches. Ignore any defects below .01 inch. For elongated defects, use the equivalent diameter; length plus width divided by two.

3.5 Qualification ratings.-

3.5.1 Grid 2 current (Ic₂).- Grid 2 current (Ic₂) as described in Method 5201.1 of MIL-STD-1311 shall not exceed ± 10 uA DC for all operating conditions.

3.5.2 Inter-electrode capacitance.- Capacitance shall be measured as described in Method 1331 of MIL-STD-1311 and shall not exceed the following:

Ck to all other electrodes - 5 uuf

Cg1 to all other electrodes - 10 uuf

3.5.3 Pressure.- Pressure shall be in accordance with Method 1141 of MIL-STD-1311, except that 35 lb/in² shall be used.

3.5.4 Voltage breakdown.- Voltage breakdown shall be as described in Method 5201, paragraph 2 of MIL-STD-1311. In addition, the tube shall withstand the heater negative with respect to the cathode 410 V DC maximum during a warm-up period not to exceed 15 seconds.

3.5.5 Voltage breakdown (magnetic).- The tube shall meet the requirements of MIL-STD-1311, Method 5201, paragraph 4, under the following conditions:

$$E_{b2} = 15,000 \text{ V DC}$$

$$E_{c1} = -300 \text{ V DC}$$

$$E_{c2} = 700 \text{ V DC}$$

$$E_{b1} = 5,600 \text{ V DC}$$

$$E_{hk} = \pm 180 \text{ V DC}$$

3.5.6 Gas ratio.- The gas ratio (Gr), as defined in Method 5206, paragraph 2 of MIL-STD-1311, shall be a maximum of 0.25.

3.5.7 Spot position.- The spot position, measured in accordance with Method 5231, paragraph 1 of MIL-STD-1311, shall fall within a 25 mm diameter circle, the center of which coincides with the geometric center of the tube face.

3.5.8 Grid cutoff voltage.- Grid cutoff voltage measured in accordance with Method 5241 of MIL-STD-1311, shall be a minimum of -50 V DC and a maximum of -70 V DC, as measured with respect to the cathode.

3.5.9 Heater-cathode leakage current.- The heater-cathode leakage current shall be as specified in Method 5251, paragraph 1 of MIL-STD-1311, under the conditions of +180 V DC and -180 V DC heater cathode voltage.

3.5.10 Grid 1 leakage current.- Grid 1 leakage current shall not exceed 3 μ A DC as specified in Method 5251, paragraph 2 of MIL-STD-1311.

3.5.11 Grid 2 leakage current.- Grid 2 leakage current shall not exceed 5 μ A DC as specified in Method 5251, paragraph 3 of MIL-STD-1311.

3.5.12 Anode 1 leakage current.- Anode 1 leakage current shall not exceed 5 μ A DC as specified in Method 5251, paragraph 4 of MIL-STD-1311.

3.5.13 Modulation.- The maximum grid voltage above cutoff shall be +30 V DC for a minimum screen current of 25 μ A per Method 5223 of MIL-STD-1311.

3.5.14 Focusing voltage.- The focusing voltage as measured in accordance with Method 5246 of MIL-STD-1311 shall be between the limits of 3,000 V DC minimum and 4,400 V DC maximum.

3.5.15 Focusing current.- The focusing electrode current for any operating condition shall be between the limits of -10 uA to +5 uA.

3.5.16 Resolution.- Line width measured in accordance with Method 5226 of MIL-STD-1311 shall not exceed 0.012 inches for an anode current of 25 uA. For a fixed focus voltage, the ratio of maximum to minimum line width shall not exceed 1.5 to 1 anywhere within the usable area of the tube. The CRT shall be such that with a G2 voltage of 400 V, the CRT shall be capable of being driven from cutoff with 0 to 45 V of video input drive with no noticeable change in focusing.

3.5.17 Heater current.- Under the conditions specified in Method 1301 of MIL-STD-1311, the heater current shall be a minimum of 540 mA and a maximum of 660 mA.

3.5.18 Stray light emission.- Stray light emission shall be as specified in Method 5216, paragraph 2 of MIL-STD-1311, under the following conditions:

$$Eb_2 = 15,000 \text{ V DC}$$

$$Eb_1 = 5,600 \text{ V DC}$$

$$Ec_2 = 700 \text{ V DC}$$

$$Ec_1 = -300 \text{ V DC}$$

$$Ef = 6.3 \text{ V}$$

3.5.19 Neck and base straightness.- The neck and base straightness shall be determined by the insertion of the tube neck in a cylinder five inches long and 1.503 inches maximum inside diameter. The cylinder shall move freely between the reference line (see Figure 1) and the base of the assembled tube.

3.5.20 Side terminal and base alignment.- The anode connector alignment with vacant pin position No. 3 shall have an angular tolerance of $\pm 30^\circ$ measured about the tube axis.

3.5.21 Emission build-up.- The emission build-up shall be a minimum of 70% where emission build-up is defined as:

$$\% \text{ Emission build-up} = \frac{Ib_2 \text{ at 30 seconds}}{Ib_2 \text{ at 60 seconds}} \times 100$$

3.5.22 Secureness of base, cap and insert.- Secureness of base shall be as specified in Method 1101A of MIL-STD-1311.

3.5.23 Permanence of marking.- Permanence of marking shall be as specified in Method 1105 of MIL-STD-1311.

3.6 Conductors.- The size of conducting wires and other parts shall be ample to preclude overheating under maximum operating conditions.

4. QUALITY ASSURANCE PROVISIONS

4.1 General.- The following document shall apply to ensure that an effective quality control program is maintained.

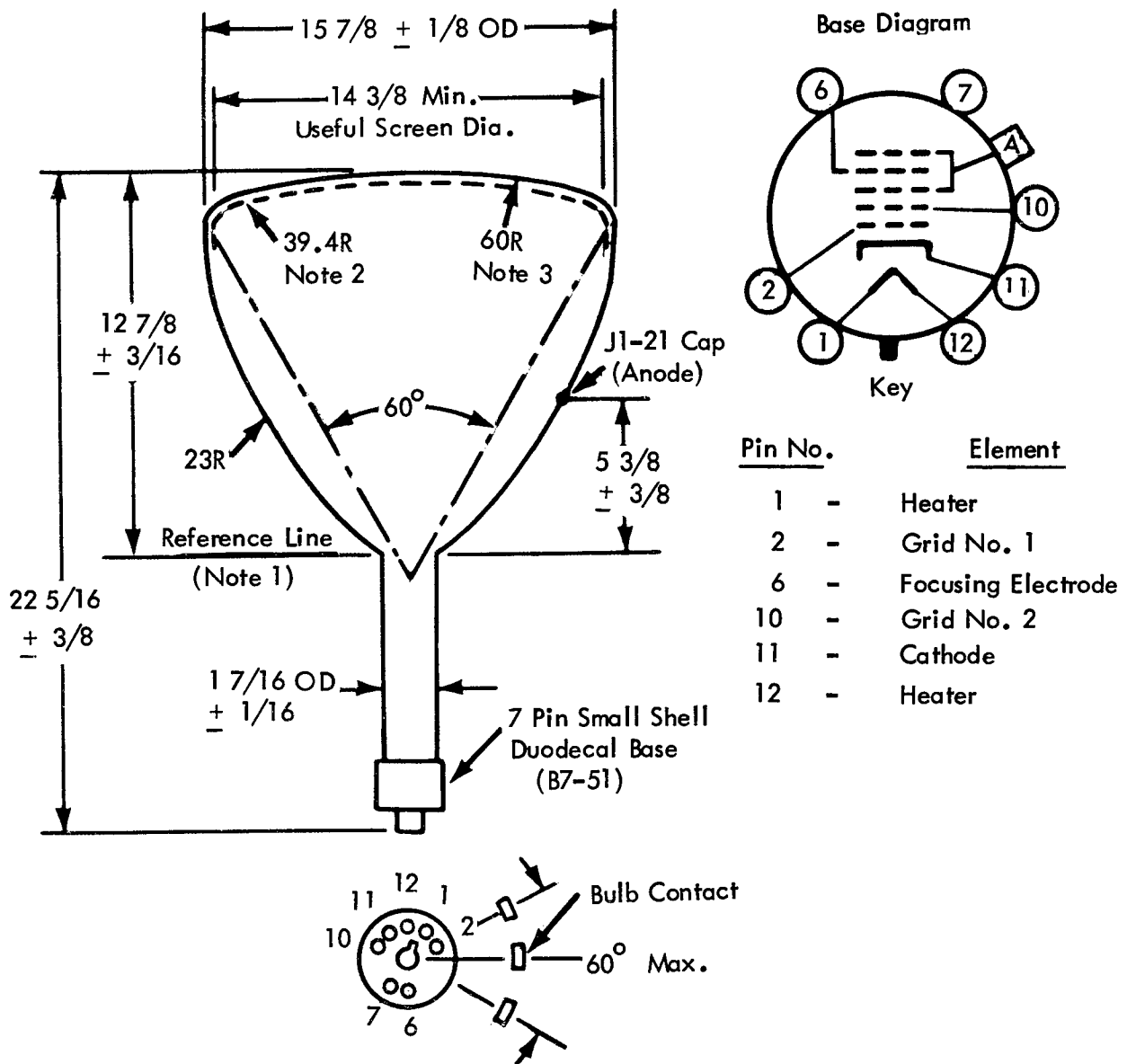
FAA-STD-013 Quality Control Program Requirements

5. PREPARATION FOR DELIVERY

5.1 General.- The equipment shall be prepared for delivery in accordance with MIL-E-75.

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FOR FIGURE 1, SEE PAGE 7



NOTES:

1. The point where JEDEC Gage G-112 will rest on bulb cone.
2. Inside face radius within a quality circle of 14.0 inches diameter, 39.4 ± 3.0 inches.
3. Outside face radius within a quality circle of 14.2 inches diameter, 60.0 ± 3.0 inches.
4. Angular dimensions approximate.

FIGURE 1. 16" CRT DIMENSIONS AND BASE DIAGRAMS

